LWG
LOWER WILLAMETTE GROUP

PORTLAND HARBOR RI/FS:
2012 MODIFICATIONS TO THE FIELD SAMPLING PLAN FOR BASS TISSUE

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This document is currently under review by US EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

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Prepared for
The Lower Willamette Group

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RECOMMENDED FOR INCLUSION IN ADMINISTRATIVE RECORD

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Acronym	Definition
Axys	Axys Analytical Services, Ltd.
DeCB	decachlorobiphenyl
DiCB	dichlorobiphenyl
DL	detection limit
EPA	US Environmental Protection Agency
FS	feasibility study
HpCB	heptachlorobiphenyl
HRGC	high-resolution gas chromatograph
HRMS	high-resolution mass spectrometer
HxCB	hexachlorobiphenyl
ID	identification
IPR	initial precision and recovery
LWG	Lower Willamette Group
MDL	method detection limit
MNR	monitored natural recovery
MRL	method reporting limit
NoCB	nonachlorobiphenyl
OcCB	octachlorobiphenyl
OPR	ongoing precision and recovery
PCB	polychlorinated biphenyl
PeCB	pentachlorobiphenyl
QC	quality control
RI	remedial investigation
RPD	relative percent difference
RRF	relative response factor
RSD	relative standard deviation
SAP	sampling and analysis plan
SDL	sample detection limit
S:N	signal to noise ratio
SMA	sediment management area
SOP	standard operating procedure
TBD	to be determined
TeCB	tetrachlorobiphenyl
TriCB	trichlorobiphenyl
WMG	wide-mouth glass

1.0 INTRODUCTION

This document presents the 2012 field sampling plan for bass tissue. In a July 10, 2012, e-mail, the US Environmental Protection Agency (EPA) requested that the Lower Willamette Group (LWG) consider supporting the collection of additional fish tissue data in the summer 2012 following a detailed sampling and analysis plan (*Sampling and Analysis Plan: Portland Harbor 2011 Baseline Smallmouth Bass Tissue Study*, hereafter referred to as the 2011 Bass Sampling and Analysis Plan [SAP]) provided by EPA on July 26, 2012. The LWG conducted a brief review of the 2011 Bass SAP and ancillary information provided by EPA on July 26, 2012, including the data from a bass collection effort performed by EPA in 2011 following the publication of the 2011 Bass SAP. Based on their review, the LWG has proposed to collect smallmouth bass tissue following the methods outlined in the 2011 Bass SAP (GSI Water Solutions 2011) (which is included as Appendix A to this document), with the exception of the modifications outlined in this document.

The objective of the 2012 bass sampling effort is to collect additional whole-body smallmouth bass fish tissue data for the site with the primary objective of establishing an additional line of evidence to support the current monitored natural recovery (MNR) evaluation in the draft feasibility study (FS) (Anchor QEA et al. 2012). Fish tissue is one line of evidence for MNR and there are other factors that may decrease contaminant concentrations in sediments. Other, more direct measures of MNR such as analysis of surface sediments will be needed as part of the remedy detailed design phase and post-remedy monitoring to verify MNR at specific locations in the Site. To more fully accomplish this goal, the LWG proposes that the following modifications to EPA's 2011 Bass SAP (GSI Water Solutions 2011) (Appendix A) be implemented for the 2012 sampling by LWG:

- **Project work** – LWG will conduct the bass sampling field effort. The modified project organization and schedule for the 2012 effort are provided in Section 2.0. The modified reporting schedule is presented in Section 6.0.
- **Sampling locations** – LWG will collect and analyze smallmouth bass as individual samples from each side of the river in each river mile (approximately five samples per each side of the river in each river mile), focusing on those areas where Round 3B fish tissue samples were collected in 2007. These locations will provide good general coverage of the site, while maximizing the ability to make comparisons with previously collected data based on comparably collected fish.

  LWG will also collect five smallmouth bass in Swan Island Lagoon, even though 2007 data are not available for this area. In this case, 2012 data will be compared with 2002 data.

  LWG will collect and analyze 10 individual smallmouth bass tissue samples from the same region upstream of the site (i.e., upstream of Ross Island) as that proposed by EPA.

The above sampling locations will result (depending on the actual sampling results regarding the number of fish caught) in the collection of 95 individual smallmouth bass within the site and 10 smallmouth bass at upstream locations for a total of 105 fish (i.e., 105 whole-body samples). Details regarding the modified target sampling locations for the 2012 effort are provided in Section 3.0.

Note that the sampling described here is focused on assessing MNR on a site-wide scale, and may be sufficient for some sediment management areas (SMAs). The sampling is not intended to provide fish tissue samples that are representative of all SMAs.

- **Sample preparation** – LWG will analyze only whole-body smallmouth bass samples. There is a clear relationship between whole-body and fillet polychlorinated biphenyl (PCB) concentrations, and the determination of risks or calculation of PRGs related to fillet consumption are not proposed as data objectives.[1] Consequently, a comparison of new data to past whole-body smallmouth bass results will provide the necessary information to support the proposed data objective. Details of the modified sample preparation procedures for the 2012 sampling effort are provided in Section 4.0 and Appendix C.
- **Laboratory analysis** – LWG will analyze fish tissue samples only for PCBs (congener analysis). Given that PCBs pose the greatest risks and are subject to a detailed evaluation in the draft FS (Anchor QEA et al. 2012), this analyte list most efficiently supports the data objective. Supporting parameters (i.e., moisture and lipid content) will also be measured.

  In addition, laboratory analyses will be conducted by Axys Analytical Services, Ltd. (Axys), of Sidney, BC, Canada (subject to LWG's ability to contract with the laboratory), which is the same laboratory that conducted remedial investigation (RI) fish tissue analyses. Details on the modified laboratory analysis methods based on the use of Axys are presented in Section 4.0. Modified shipping details are presented in Section 3.0.

  The validation of analytical data will be conducted by EcoChem (subject to LWG's ability to contract with the laboratory), which is the same firm that validated RI fish tissue data. Details on the modified validation methods based on the use of EcoChem are presented in Section 4.0.
- **Data management** – Tissue sample identification (ID) codes will be modified to describe the 2012 sampling and analysis of whole-body samples. The modified 2012 sampling identification scheme is presented in Section 5.0.

Details on these modifications are presented in the following sections.

[1] Additional information on the relationship between whole body and fillet PCB concentrations in smallmouth bass will be provided to EPA at a later date.

2.0 PROJECT ORGANIZATION, HEALTH AND SAFETY, AND SCHEDULE

This section presents the 2012 project organization, health and safety, and schedule modifications to the 2011 Bass SAP (Appendix A).

2.1 TEAM ORGANIZATION AND RESPONSIBILITIES

Key LWG personnel will be identified. Two to three LWG scientists will be working in the field along with members of the Oregon Bass and Panfish Club and the Bass Federation.

2.2 HEALTH AND SAFETY

A health and safety plan will be provided by the LWG lead performing the field work.

2.3 PROJECT SCHEDULE

The following modifications have been made to the 2011 Bass SAP (GSI Water Solutions 2011) sampling effort schedule:

- The target start date for field work is Saturday, August 25, 2012. Sampling is expected to last 14 days, with a fleet of two to three boats. Actual sampling dates will be dependent on the availability of the members of the Oregon Bass and Panfish Club and the Bass Federation. Sampling is anticipated to be completed by Sunday, September 16, 2012. As with the 2011 sampling effort, the field schedule may be affected by adverse weather, fishing success, access to sampling locations, equipment conditions, and/or other unforeseen factors.

- Laboratory homogenization and analysis will be initiated as fish are shipped to the laboratory. The laboratory will provide electronic reports to EcoChem approximately 6 weeks following homogenization of all fish (mid-November). Validated data packages will be available from EcoChem approximately 4 weeks following receipt of electronic data reports (mid-December).

- LWG will prepare a draft field report within 6 weeks following the completion of field activities (early November).

- LWG will prepare a draft data report within 6 weeks following the completion of the final validated dataset (expected late January 2013).

3.0 SAMPLE COLLECTION PROCEDURES

This section presents the 2012 modifications to the 2011 Bass SAP (GSI Water Solutions 2011) (Appendix A). No changes are proposed to the sample collection methods and details outlined in the 2011 Bass SAP for fish collection, fish handling and storage, navigation and station location, field logbook recording, equipment and supplies, equipment decontamination, field and tissue homogenization quality control (QC) samples, sampling handling and transport, waste management, and permits. The 2012 field sampling forms contain the same information as did the 2011 fields sampling forms and are included in Appendix B of this document. Consistent with measurements taken during the 2011 field collection effort, both total length and fork length will be measured and recorded. Fork length will be measured from the tip of the snout to the fork of the caudal fin, with the fin extended. Also consistent with the 2011 field collection effort (GSI Water Solutions 2011), smallmouth bass that do not meet the target total length (225 to 355 mm [approximately 9 to 14 in.]) will be released. The lengths of any fish that are released (either smallmouth bass that do not meet target length requirements or any species other than smallmouth bass that may be caught) will be recorded prior to the release of the fish.

The target number of samples and target locations have been updated for the 2012 sampling effort. A total of 105 smallmouth bass (target length from 225 to 355 mm [approximately 9 to 14 in.]) are targeted for collection and analysis as individual fish analytical samples. The target locations include the following:

- A total of 95 smallmouth bass are targeted from 95 target locations within the site. The number of fish targeted is equivalent to five smallmouth bass from each side of the river in each of the 10 river miles (for a total of 90 fish). Smallmouth bass target locations are distributed on both sides of the river and specifically focus on those areas where Round 3B fish tissue samples were collected in 2007. These locations will provide good coverage of the site in general, while maximizing the ability to make comparisons with previously collected data based on comparably collected fish from 2007 sampling. Although no smallmouth bass were collected from Swan Island Lagoon in 2007, an additional five smallmouth bass are targeted from Swan Island Lagoon Area from five target locations, even though 2007 data are not available for this area. In this case, 2012 data will be compared with 2002 data from this area.
- A total of 10 smallmouth bass are targeted from 10 target locations within the same upstream region of the site (i.e., upstream of Ross Island) as proposed by EPA in the 2011 Bass SAP (GSI Water Solutions 2011) (Appendix A).

Table 3-1 presents the proposed 2012 target sampling locations. Figure 3-1 presents the proposed 2012 target sampling locations overlain by the locations of bass samples that were previously collected, including those from LWG's Round 1 and Round 3 sampling

efforts in 2002 and 2007, respectively, and from EPA's 2011 sampling effort.[2] Figure 3-1 illustrates the overlap of the proposed 2012 sampling locations with the Round 3 (2007) sampling locations. Figure 3-2 presents a site-wide overview of the 2012 target sampling locations.

Table 3-1. Smallmouth Bass Sampling Target Locations

Location	Target Northing[a]	Target Easting[a]
RM02E	721091	7616823
RM02E	721697	7616817
RM02E	722146	7616831
RM02E	722633	7616908
RM02E	723188	7617025
RM02E	723595	7617135
RM02E	723907	7617264
RM02E	724269	7617438
RM02E	724695	7617593
RM02W	720641	7615094
RM02W	721234	7615062
RM03E	716315	7618160
RM03E	716890	7617969
RM03E	717171	7618977
RM03E	717179	7618404
RM03E	720624	7616811
RM03W	715563	7616686
RM03W	719039	7615225
RM03W	719601	7615192
RM03W	720118	7615154
RM04E	715731	7618424
RM04W	710997	7619091
RM04W	711591	7618710
RM04W	712341	7618266
RM04W	713991	7617496
RM04W	714356	7617335
RM04W	714742	7617146
RM04W	715127	7616880
RM05E	707433	7623395
RM05E	708286	7622527
RM05E	709177	7621606
RM05W	707287	7621965

[2] Figure 3-1 does not include the collection locations for EPA's 2011 bass samples that were not analyzed because of incorrect processing by EPA's Contract Laboratory Program laboratory.

Table 3-1. Smallmouth Bass Sampling Target Locations

Location	Target Northing[a]	Target Easting[a]
RM05W	708317	7621092
RM05W	709864	7619835
RM05W	710433	7619453
RM06E	705579	7626774
RM06E	705651	7627153
RM06E	706166	7625193
RM06E	706842	7624259
RM06W	703564	7626700
RM06W	704477	7626031
RM06W	705022	7625135
RM06W	705455	7624443
RM06W	705894	7623616
RM06W	706523	7622761
RM07E	701520	7631960
RM07E	701674	7631197
RM07E	702094	7630456
RM07E	702531	7629920
RM07E	703147	7629561
RM07E	703554	7628674
RM07E	704316	7627581
RM07W	699828	7630202
RM07W	700469	7628809
RM07W	701055	7628533
RM07W	702008	7628447
RM07W	702774	7627610
RM08E	697827	7634828
RM08E	698195	7634402
RM08E	701702	7632540
RM08E[b]	699727	7635463
RM08E[b]	700738	7632883
RM08E[b]	700808	7634186
RM08E[b]	701315	7633193
RM08W	696616	7633864
RM08W	696793	7633410
RM08W	696948	7632958
RM08W	697201	7632425
RM08W	697905	7631606
RM08W	699071	7630871
RM09E[b]	698800	7636409

Table 3-1. Smallmouth Bass Sampling Target Locations

Location	Target Northing[a]	Target Easting[a]
RM09E	695556	7638615
RM09E	696132	7637473
RM09E	696586	7636818
RM09E	696930	7636178
RM09E	697399	7635449
RM09W	693991	7638375
RM09W	694074	7637192
RM09W	694387	7637654
RM09W	696277	7634365
RM10E	692367	7641241
RM10E	693412	7640409
RM10E	694475	7639903
RM10W	690026	7641983
RM10W	690700	7640900
RM10W	692722	7639757
RM10W	693386	7639061
RM11E	687310	7645567
RM11E	688098	7645079
RM11E	688792	7644651
RM11E	689336	7644013
RM11E	689908	7643360
RM11W	686808	7645133
RM11W	687874	7644120
RM11W	688909	7643031
RM15W	667554	7647121
RM15W	668318	7646369
RM15W	668494	7646307
RM15W	668743	7647152
RM15W	668795	7646308
RM16W	660486	7647052
RM16W	662691	7646060
RM16W	665041	7645739
RM17W	655743	7649425
RM17W	657762	7648369

[a] NAD83 State Plane HARN Oregon North, International Feet; coordinates are rounded to the nearest foot.

[b] Target sampling location is located in Swan Island Lagoon.

Each location will be targeted at least once during the 2-week sampling period. Target locations may be modified in the field, if necessary, because of the inaccessibility of target sampling locations and/or to better target specific bass habitat. Following the 2-week sampling effort, LWG and EPA will discuss whether additional sampling is warranted based on the catch results of the 2-week sampling effort.

Because Axys will analyze the samples, the procedures for shipping have been modified and are presented here. Shipping methods for tissue samples will follow the general procedures outlined in Appendix C of the *Portland Harbor RI/FS Round 3B Field Sampling Plan For Fish and Invertebrate Tissue and Co-located Surface Sediment* (Integral 2007). All samples will be stored frozen prior to shipping. Samples will be placed in medium-sized coolers (24 in. x 14 in. x 15 in.); the coolers' final weight should not exceed 50 lbs for health and safety reasons. Coolers will be shipped to Axys via overnight delivery service or courier. Coolers will be prepared in the following manner:

1. Line cooler bottom with dry ice; place a layer o f wrapped and bagged fish tissue samples in the cooler and add another layer of dry ice.

2. Build alternating layers in this manner, ending with a layer of dry ice as the top layer. Wet ice may be added to the cooler in addition to dry ice.

3. Place a temperature blank in each cooler.

4. Place the chain-of-custody form in a ziplock bag and tape the bag to the inside of the cooler lid.

5. Close the lid and seal the cooler with three cus tody seals, one on each side of the lid opening.

6. Use strapping or packing tape to seal the cooler , wrapping twice around the girth and once around the length.

7. Attach a placard that state "Environmental Sampl es of No Commercial Value, Keep Frozen, This Side Up, and Handle with Care" to the cooler.

Upon receipt of the coolers, the laboratory is required to log in samples and note any non-conformances.

4.0 LABORATORY ANALYSIS AND QUALITY ASSURANCE/ QUALITY CONTROL

This section presents the 2012 modifications to the 2011 Bass SAP (GSI Water Solutions 2011) (Appendix A).

4.1 CHEMICAL ANALYSES

All bass tissue samples will be analyzed as whole-body individual samples for PCB congeners, lipid content, and moisture content by Axys. No composite or fillet samples are proposed. The laboratory methods for tissue analysis, specific to Axys, are provided in Table 4-1. Axys will homogenize the tissue samples according the procedures outlined in Appendix C (Axys standard operating procedure [SOP] entitled "Procedures for Homogenization of Solids and Tissues"). Smallmouth bass whole fish will be scaled (scraped off) and any adhering slime removed prior to homogenizing using the methods presented in LWG's *Portland Harbor Remedial Investigation/Feasibility Study Round 1 Quality Assurance Project Plan* (SEA 2002). Once the scales and slime have been scraped off of the fish or the skin has been removed, the outside of the fish will be washed with contaminant-free distilled water.

Table 4-1. Laboratory Methods for Tissue Analysis

		Sample Preparation		Qualitative Analysis	
Analyte	**Laboratory**	**Protocol**	**Procedure**	**Protocol**	**Procedure**
Lipids (percent)[a]	Axys Analytical Services, Ltd.	EPA 1668C	Soxhlet extraction using dichlormethane	Axys SOP SAL-020	Gravimetric
Moisture (percent)	Axys Analytical Services, Ltd.	Axys SOP SAL-015	Weighing subsample and oven drying	Axys SOP SAL-015	Weighing oven dried sample
PCB congeners	Axys Analytical Services, Ltd.	EPA 1668C	Soxhlet extraction with dichloromethane. Sample extraction cleanups may included multi-layed acid/base silica, florisil, alumina, biobeads, and/or 4.5% carbon/celite	EPA 1668C HRGC/HRMS	

[a] A portion of the PCB congener extraction will be u sed for lipid analysis.

EPA – US Environmental Protection Agency
HRGC – high-resolution gas chromatograph
HRMS – high-resolution mass spectrometer
PCB – polychlorinated biphenyl
SOP – standard operating procedure

4.2 LABORATORY QA/QC PROCEDURES

Laboratory quality assurance/quality control (QA/QC) will be maintained through the use of standard EPA methods and other accepted methods and standard analytical procedures

for the target analytes. Sample preservation, holding times, and sample volume requirements are provided in Table 4-2. The field and tissue homogenization QC sample are specified in Table 4-3. Laboratory methods, QA procedures, and QA/QC requirements, specific to Axys, are provided in Tables 4-4 through 4-7.

Table 4-2. Sample Preservation, Holding Times and Volume Requirements

Analysis	Laboratory	Sample Size[a]	Preservation	Holding Time	Container
Lipids (percent)[a]	Axys Analytical Services, Ltd.	10 g	Deep frozen (-20±4 °C)	1 year	WMG
Moisture (percent)	Axys Analytical Services, Ltd.	10 g	Deep frozen (-20±4 °C)	1 year	WMG
PCB congeners	Axys Analytical Services, Ltd.	10 g	Deep frozen (-20±4 °C)	1 year	WMG
Archive	Axys Analytical Services, Ltd.	NA	Deep frozen (-20±4 °C)	NA	WMG

[a] Matrix QC samples will be prepared by the laboratory only if sufficient sample volume is available.

NA – not applicable
PCB – polychlorinated biphenyl
QC – quality control
WMG – wide-mouth glass

Table 4-3. Field and Tissue Homogenization QC Samples

Sample Type	Minimum Frequency	Estimated Number of QC Samples
Tissue homogenization splits (duplicates)	5 percent	6
Tissue homogenization rinsate blanks	5 percent	6
Temperature blanks	1 per cooler	TBD

[a] Matrix QC samples will be prepared by the laboratory only if sufficient sample volume is available.

QC – quality control
TBD – to be determined

Table 4-4. Method Detection Limits and Method Reporting Limits and Control Limits for PCB Congener Tissue and Rinsate Samples

	Tissue		Equipment Rinsate Blanks	
Analyte	MDL (ng/kg)[a]	MRL (ng/kg)	MDL (pg/L)[a]	MRL (pg/L)
Conventional Analyses				
Lipids	0.1	0.1	NA	NA
PCB Congeners				
PCB 1	0.21	2.0	1.6	20.0
PCB 2	0.10	2.0	2.2	20.0
PCB 3	0.57	2.0	4.5	20.0
PCB 4	0.37	2.0	2.2	20.0
PCB 5	0.16	2.0	1.1	20.0
PCB 6	0.08	2.0	1.7	20.0
PCB 7	0.16	2.0	1.9	20.0
PCB 8	0.15	2.0	2.7	20.0
PCB 9	0.13	2.0	2.6	20.0
PCB 10	0.17	2.0	2.0	20.0
PCB 11	0.40	2.0	4.2	20.0
PCB 12/13	0.25	2.0	2.4	20.0
PCB 14	0.14	2.0	1.3	20.0
PCB 15	0.65	2.0	3.1	20.0
PCB 16	0.20	2.0	3.1	20.0
PCB 17	0.34	2.0	2.1	20.0
PCB 19	0.43	2.0	2.3	20.0
PCB 21/33	0.42	2.0	4.8	20.0
PCB 22	0.16	2.0	2.3	20.0
PCB 23	0.63	2.0	2.6	20.0
PCB 24	0.44	2.0	2.3	20.0
PCB 25	0.33	2.0	2.0	20.0
PCB 26/29	0.53	2.0	4.6	20.0
PCB 27	0.26	2.0	1.8	20.0
PCB 28/20	0.46	2.0	6.7	20.0
PCB 30/18	0.48	2.0	3.2	20.0
PCB 31	0.30	2.0	4.0	20.0
PCB 32	0.31	2.0	1.5	20.0
PCB 34	0.59	2.0	1.8	20.0
PCB 35	0.33	2.0	2.5	20.0
PCB 36	0.15	2.0	1.0	20.0
PCB 37	0.39	2.0	2.6	20.0
PCB 38	0.26	2.0	1.7	20.0
PCB 39	0.26	2.0	1.3	20.0
PCB 41/40/71	1.09	2.0	8.4	20.0
PCB 42	0.45	2.0	2.1	20.0

Table 4-4. Method Detection Limits and Method Reporting Limits and Control Limits for PCB Congener Tissue and Rinsate Samples

	Tissue		Equipment Rinsate Blanks	
Analyte	MDL (ng/kg)[a]	MRL (ng/kg)	MDL (pg/L)[a]	MRL (pg/L)
PCB 43	0.48	2.0	2.0	20.0
PCB 44/47/65	0.84	2.0	8.9	20.0
PCB 45/51	0.44	2.0	4.4	20.0
PCB 46	0.19	2.0	0.6	20.0
PCB 48	0.25	2.0	2.8	20.0
PCB 50/53	0.48	2.0	3.4	20.0
PCB 52	0.26	2.0	7.6	20.0
PCB 54	0.34	2.0	2.0	20.0
PCB 55	0.26	2.0	1.9	20.0
PCB 56	0.32	2.0	3.9	20.0
PCB 57	0.30	2.0	2.9	20.0
PCB 58	0.34	2.0	2.7	20.0
PCB 59/62/75	0.85	2.0	7.5	20.0
PCB 60	0.44	2.0	1.8	20.0
PCB 61/70/74/76	0.83	2.0	15.1	20.0
PCB 63	0.23	2.0	2.4	20.0
PCB 64	0.29	2.0	3.5	20.0
PCB 66	0.25	2.0	6.6	20.0
PCB 67	0.31	2.0	2.5	20.0
PCB 68	0.34	2.0	2.9	20.0
PCB 69/49	0.34	2.0	6.0	20.0
PCB 72	0.29	2.0	3.2	20.0
PCB 73	0.18	2.0	1.7	20.0
PCB 77	0.21	2.0	1.6	20.0
PCB 78	0.15	2.0	2.3	20.0
PCB 79	0.23	2.0	1.8	20.0
PCB 80	0.29	2.0	3.4	20.0
PCB 81	0.23	2.0	1.9	20.0
PCB 82	0.25	2.0	2.7	20.0
PCB 83/99	0.93	2.0	16.6	20.0
PCB 84	0.56	2.0	6.2	20.0
PCB 88/91	0.91	2.0	6.3	20.0
PCB 89	0.59	2.0	2.4	20.0
PCB 92	0.55	2.0	5.0	20.0
PCB 94	0.45	2.0	4.2	20.0
PCB 95/100/93/102/98	1.98	2.0	16.7	20.0
PCB 96	0.43	2.0	3.3	20.0
PCB 103	0.30	2.0	4.3	20.0
PCB 104	0.43	2.0	2.8	20.0

Table 4-4. Method Detection Limits and Method Reporting Limits and Control Limits for PCB Congener Tissue and Rinsate Samples

	Tissue		Equipment Rinsate Blanks	
Analyte	MDL (ng/kg)[a]	MRL (ng/kg)	MDL (pg/L)[a]	MRL (pg/L)
PCB 105	0.27	2.0	7.2	20.0
PCB 106	0.26	2.0	3.3	20.0
PCB 108/124	0.39	2.0	4.4	20.0
PCB 109/119/86/97/125/87	2.36	2.0	17.3	20.0
PCB 107	0.31	2.0	4.2	20.0
PCB 110/115	0.64	2.0	24.2	20.0
PCB 111	0.34	2.0	2.1	20.0
PCB 112	0.44	2.0	2.0	20.0
PCB 113/90/101	1.71	2.0	17.9	20.0
PCB 114	0.20	2.0	1.4	20.0
PCB 117/116/85	1.12	2.0	5.7	20.0
PCB 118	0.22	2.0	17.4	20.0
PCB 120	0.17	2.0	2.1	20.0
PCB 121	0.58	2.0	2.3	20.0
PCB 122	0.20	2.0	2.3	20.0
PCB 123	0.39	2.0	3.6	20.0
PCB 126	0.12	2.0	2.2	20.0
PCB 127	0.27	2.0	2.7	20.0
PCB 128/166	0.40	2.0	6.0	20.0
PCB 130	0.11	2.0	3.5	20.0
PCB 131	0.26	2.0	2.6	20.0
PCB 132	0.39	2.0	6.1	20.0
PCB 133	0.23	2.0	2.4	20.0
PCB 134/143	0.52	2.0	4.1	20.0
PCB 136	0.22	2.0	2.7	20.0
PCB 137	0.31	2.0	3.1	20.0
PCB 138/163/129/160	0.76	2.0	15.7	20.0
PCB 139/140	0.40	2.0	4.4	20.0
PCB 141	0.33	2.0	3.4	20.0
PCB 142	0.19	2.0	1.6	20.0
PCB 144	0.20	2.0	2.2	20.0
PCB 145	0.34	2.0	2.2	20.0
PCB 146	0.43	2.0	4.7	20.0
PCB 147/149	0.47	2.0	9.4	20.0
PCB 148	0.28	2.0	2.7	20.0
PCB 150	0.25	2.0	3.9	20.0
PCB 151/135/154	0.58	2.0	4.0	20.0
PCB 152	0.27	2.0	2.8	20.0
PCB 153/168	0.51	2.0	9.6	20.0

Table 4-4. Method Detection Limits and Method Reporting Limits and Control Limits for PCB Congener Tissue and Rinsate Samples

	Tissue		Equipment Rinsate Blanks	
Analyte	MDL (ng/kg)[a]	MRL (ng/kg)	MDL (pg/L)[a]	MRL (pg/L)
PCB 155	0.43	2.0	2.7	20.0
PCB 156/157	0.22	4.0	3.5	40.0
PCB 158	0.27	2.0	2.5	20.0
PCB 159	0.28	2.0	3.6	20.0
PCB 161	0.25	2.0	2.4	20.0
PCB 162	0.16	2.0	3.0	20.0
PCB 164	0.20	2.0	4.1	20.0
PCB 165	0.21	2.0	2.9	20.0
PCB 167	0.24	2.0	2.0	20.0
PCB 169	0.13	2.0	1.9	20.0
PCB 170	0.28	2.0	2.5	20.0
PCB 171/173	0.19	2.0	5.7	20.0
PCB 172	0.19	2.0	2.5	20.0
PCB 174	0.23	2.0	1.5	20.0
PCB 175	0.39	2.0	2.4	20.0
PCB 176	0.18	2.0	1.6	20.0
PCB 177	0.38	2.0	3.4	20.0
PCB 178	0.17	2.0	3.3	20.0
PCB 179	0.13	2.0	1.8	20.0
PCB 180/193	0.36	2.0	4.7	20.0
PCB 181	0.29	2.0	2.9	20.0
PCB 182	0.24	2.0	3.2	20.0
PCB 183/185	0.46	2.0	3.1	20.0
PCB 184	0.18	2.0	1.1	20.0
PCB 186	0.23	2.0	1.4	20.0
PCB 187	0.30	2.0	2.6	20.0
PCB 188	0.27	2.0	1.1	20.0
PCB 189	0.27	2.0	2.1	20.0
PCB 190	0.31	2.0	3.0	20.0
PCB 191	0.27	2.0	2.7	20.0
PCB 192	0.32	2.0	1.6	20.0
PCB 194	0.21	2.0	3.8	20.0
PCB 195	0.30	2.0	4.1	20.0
PCB 196	0.26	2.0	2.1	20.0
PCB 197/200	0.68	2.0	11.3	20.0
PCB 198/199	0.37	2.0	3.8	20.0
PCB 201	0.26	2.0	2.4	20.0
PCB 202	0.20	2.0	2.0	20.0
PCB 203	0.15	2.0	3.0	20.0

Table 4-4. Method Detection Limits and Method Reporting Limits and Control Limits for PCB Congener Tissue and Rinsate Samples

	Tissue		Equipment Rinsate Blanks	
Analyte	MDL (ng/kg)[a]	MRL (ng/kg)	MDL (pg/L)[a]	MRL (pg/L)
PCB 204	0.14	2.0	2.3	20.0
PCB 205	0.12	2.0	2.7	20.0
PCB 206	0.19	2.0	2.3	20.0
PCB 207	0.19	2.0	1.4	20.0
PCB 208	0.26	2.0	1.3	20.0
PCB 209	0.12	2.0	2.0	20.0

[a] The laboratory will use an SDL. SDLs will vary bas ed on the amount of sample analyzed, the analytical dilution, and percent moisture of the sample.

MDL – method detection limit
MRL – method reporting limit
PCB – polychlorinated biphenyl
SDL – sample detection limit
NA – not applicable

Table 4-5. Laboratory Control Limits for Moisture and Lipids

	Precision	
Analyte	Type of Duplicate	Control Limit (RPD)
Lipids (percent)	Matrix duplicate[a]	20
Moisture (percent)	Matrix duplicate	20

[a] Each sample will be analyzed in duplicate.

RPD – relative percent difference

Table 4-6. Acceptance Criteria for Quality Control Samples for PCB Congener Analysis

Congener	Cong. No.[a]	Test Conc. (ng/mL)	Calibration/Verification (%)		IPR (%)[b]		OPR (%)[b]		Labeled Compound (% recovery in samples)[b]	
			Warning Limits	Acceptance Limits	RSD	)	Warning Limits	Acceptance Limits	Warning Limits	Acceptance Limits
2-MoCB	1	50	75 – 125	75 – 125	25	70 – 130	70 – 130	60 – 135	NA	NA
4-MoCB	3	50	75 – 125	75 – 125	25	70 – 130	70 – 130	60 – 135	NA	NA
2,2'-DiCB	4	50	75 – 125	75 – 125	25	70 – 130	70 – 1 30	60 – 135	NA	NA
4,4'-DiCB	15	50	75 – 125	75 – 125	25	70 – 130	70 – 130	60 – 135	NA	NA
2,2'6-TrCB	19	50	75 – 125	75 – 125	25	70 – 130	70 – 130	60 – 135	NA	NA
3,4,4'-TrCB	37	50	75 – 125	75 – 125	25	70 – 130	70 – 130	60 – 135	NA	NA
2,2'6,6'TeCB	54	50	75 – 125	75 – 125	25	70 – 130	70 – 130	60 – 135	NA	NA
3,3',4,4'-TeCB	77	50	75 – 125	75 – 125	25	70 – 130	70 – 130	60 – 135	NA	NA
3,4,4',5-TeCB	81	50	75 – 125	75 – 125	25	70 – 130	7 0 – 130	60 – 135	NA	NA
2,2',4,6,6'-PeCB	104	50	75 – 125	75 – 125	25	70 – 1 30	70 – 130	60 – 135	NA	NA
2,3,3',4,4'-PeCB	105	50	75 – 125	75 – 125	25	70 – 1 30	70 – 130	60 – 135	NA	NA
2,3,4,4',5-PeCB	114	50	75 – 125	75 – 125	25	70 – 13 0	70 – 130	60 – 135	NA	NA
2,3',4,4',5-PeCB	118	50	75 – 125	75 – 125	25	70 – 1 30	70 – 130	60 – 135	NA	NA
2',3,4,4',5-PeCB	123	50	75 – 125	75 – 125	25	70 – 1 30	70 – 130	60 – 135	NA	NA
3,3',4,4',5-PeCB	126	50	75 – 125	75 – 125	25	70 – 1 30	70 – 130	60 – 135	NA	NA
2,2',4,4',6,6'-HxCB	155	50	75 – 125	75 – 125	25	70 – 130	70 – 130	60 – 135	NA	NA
2,3,3',4,4',5-HxCB	156	50	75 – 125	75 – 125	25	70 – 130	70 – 130	60 – 135	NA	NA
2,3,3',4,4',5'-HxCB	157	50	75 – 125	75 – 125	25	70 – 130	70 – 130	60 – 135	NA	NA
2,3',4,4',5,5'-HxCB	167	50	75 – 125	75 – 125	25	70 – 130	70 – 130	60 – 135	NA	NA
3,3',4,4',5,5'-HxCB	169	50	75 – 125	75 – 125	25	70 – 130	70 – 130	60 – 135	NA	NA
2,2',3,4',5,6,6'-HpCB	188	50	75 – 125	75 – 125	25	7 0 – 130	70 – 130	60 – 135	NA	NA
2,3,3',4,4',5,5'-HpCB	189	50	75 – 125	75 – 125	25	7 0 – 130	70 – 130	60 – 135	NA	NA
2,2',3,3',5,5',6,6'-OcCB	202	50	75 – 125	75 – 125	25	70 – 130	70 – 130	60 – 135	NA	NA
2,3,3',4,4',5,5',6-OcCB	205	50	75 – 125	75 – 125	25	70 – 130	70 – 130	60 – 135	NA	NA
2,2',3,3',4,4',5,5',6-NoCB	206	50	75 – 125	75 – 125	25	70 – 130	70 – 130	60 – 135	NA	NA
2,2',3,3,'4,5,5',6,6'-NoCB	208	50	75 – 125	75 – 125	25	70 – 130	70 – 130	60 – 135	NA	NA
DeCB	209	50	75 – 125	75 – 125	25	70 – 130	70 – 130	60 – 135	NA	NA

Table 4-6. Acceptance Criteria for Quality Control Samples for PCB Congener Analysis

Congener	Cong. No.[a]	Test Conc. (ng/mL)	Calibration/Verification (%)		IPR (%)[b]		OPR (%)[b]		Labeled Compound (% recovery in samples)[b]	
			Warning Limits	Acceptance Limits	RSD		Warning Limits	Acceptance Limits	Warning Limits	Acceptance Limits
Labeled Compounds										
$^{13}C_{12}$-2-MoCB	1L	100	65 – 135	50 – 145	70	20 – 135	15 – 1	40	15 – 145	15 – 130	5 – 145
$^{13}C_{12}$-4-MoCB	3L	100	65 – 135	50 – 145	70	20 – 135	15 – 1	40	15 – 145	15 – 130	5 – 145
$^{13}C_{12}$-2,2'-DiCB	4L	100	65 – 135	50 – 145	70	20 – 135	30	– 140	15 – 145	25 – 130	5 – 145
$^{13}C_{12}$-4,4'-DiCB	15L	100	65 – 135	50 – 145	70	20 – 135	30	– 140	15 – 145	25 – 130	5 – 145
$^{13}C_{12}$-2,2',6-TrCB	19L	100	65 – 135	50 – 145	70	20 – 135		30 – 140	15 – 145	30 – 130	5 – 145
$^{13}C_{12}$-3,4,4'-TrCB	37L	100	65 – 135	50 – 145	70	20 – 135		30 – 140	15 – 145	30 – 130	5 – 145
$^{13}C_{12}$-2,2',6,6'-TeCB	54L	100	65 – 135	50 – 145	70	20 – 1	35	30 – 140	15 – 145	30 – 130	5 – 145
$^{13}C_{12}$-3,3',4,4'-TeCB	77L	100	65 – 135	50 – 145	50	45 – 1	35	30 – 140	40 – 145	30 – 130	10 – 145
$^{13}C_{12}$-3,4,4',5-TeCB	81L	100	65 – 135	50 – 145	50	45 – 13	5	30 – 140	40 – 145	30 – 130	10 – 145
$^{13}C_{12}$-2,2',4,6,6'-PeCB	104L	100	65 – 135	50 – 145	50	45	– 135	30 – 140	40 – 145	40 – 130	10 – 145
$^{13}C_{12}$-2,3,3',4,4'-PeCB	105L	100	65 – 135	50 – 145	50	45	– 135	30 – 140	40 – 145	40 – 130	10 – 145
$^{13}C_{12}$-2,3,4,4',5-PeCB	114L	100	65 – 135	50 – 145	50	45 –	135	30 – 140	40 – 145	40 – 130	10 – 145
$^{13}C_{12}$-2,3',4,4',5-PeCB	118L	100	65 – 135	50 – 145	50	45	– 135	30 – 140	40 – 145	40 – 130	10 – 145
$^{13}C_{12}$-2',3,4,4',5-PeCB	123L	100	65 – 135	50 – 145	50	45	– 135	30 – 140	40 – 145	40 – 130	10 – 145
$^{13}C_{12}$-3,3',4,4',5-PeCB	126L	100	65 – 135	50 – 145	50	45	– 135	30 – 140	40 – 145	40 – 130	10 – 145
$^{13}C_{12}$-2,2',4,4',6,6'-HxCB	155L	100	65 – 135	50 – 145	50	45 – 135		30 – 140	40 – 145	40 – 130	10 – 145
$^{13}C_{12}$-2,3,3',4,4',5-HxCB	156L	100	65 – 135	50 – 145	50	45 – 135		30 – 140	40 – 145	40 – 130	10 – 145
$^{13}C_{12}$-2,3,3',4,4',5'-HxCB	157L	100	65 – 135	50 – 145	50	45 – 135		30 – 140	40 – 145	40 – 130	10 – 145
$^{13}C_{12}$-2,3',4,4',5,5'-HxCB	167L	100	65 – 135	50 – 145	50	45 – 135		30 – 140	40 – 145	40 – 130	10 – 145
$^{13}C_{12}$-3,3',4,4',5,5'-HxCB	169L	100	65 – 135	50 – 145	50	45 – 135		30 – 140	40 – 145	40 – 130	10 – 145
$^{13}C_{12}$-2,2',3,3',4,4',5-HpCB	170L	100	65 – 135	50 – 145	50	45 – 135		30 – 140	40 – 145	40 – 130	10 – 145
$^{13}C_{12}$-2,2',3,4,4',5,5'-HpCB	180L	100	65 – 135	50 – 145	50	45 – 135		30 – 140	40 – 145	40 – 130	10 – 145
$^{13}C_{12}$-2,2',3,4',5,6,6'-HpCB	188L	100	65 – 135	50 – 145	50	45 – 135		30 – 140	40 – 145	40 – 130	10 – 145
$^{13}C_{12}$-2',3,3',4,4',5,5'-HpCB	189L	100	65 – 135	50 – 145	50	45 – 135		30 – 140	40 – 145	40 – 130	10 – 145
$^{13}C_{12}$-2,2',3,3',5,5',6,6'-OcCB	202L	100	65 – 135	50 – 145	50	45 – 135		30 – 140	40 – 145	40 – 130	10 – 145
$^{13}C_{12}$-2,3,3',4,4',5,5',6-OcCB	205L	100	65 – 135	50 – 145	50	45 – 135		30 – 140	40 – 145	40 – 130	10 – 145
$^{13}C_{12}$-2,2',3,3',4,4',5,5',6-NoCB	206L	100	65 – 135	50 – 145	50	45 – 135		30 – 140	40 – 145	40 – 130	10 – 145
$^{13}C_{12}$-2,2',3,3',4,5,5',6,6'-NoCB	208L	100	65 – 135	50 – 145	50	45 – 135		30 – 140	40 – 145	40 – 130	10 – 145
$^{13}C_{12}$-2,2',3,3',4,4',5,5',6,6'-DeCB	209L	100	65 – 135	50 – 145	50	45 – 135		30 – 140	40 – 145	40 – 130	10 – 145

Table 4-6. Acceptance Criteria for Quality Control Samples for PCB Congener Analysis

Congener	Cong. No.[a]	Test Conc. (ng/mL)	Calibration/Verification (%) Warning Limits	Calibration/Verification (%) Acceptance Limits	IPR (%)[b] RSD	IPR (%)[b] $\bar{x}$	OPR (%)[b] Warning Limits	OPR (%)[b] Acceptance Limits	Labeled Compound (% recovery in samples)[b] Warning Limits	Labeled Compound (% recovery in samples)[b] Acceptance Limits
Cleanup Standards										
$^{13}C_{12}$-2,4,4'-TriCB	28L	100	60 – 130	65 – 135	70	20 – 135	40 – 125	15 – 145	40 – 130	5 – 145
$^{13}C_{12}$-2,3,3',5,5'-PeCB	111L	100	60 – 130	75 – 125	50	45 – 135	40 – 125	40 – 145	40 – 130	10 – 145
$^{13}C_{12}$-2,2',3,3',5,5',6-HpCB	178L	100	60 – 130	75 – 125	50	45 – 135	40 – 125	40 – 145	40 – 130	10 – 145

Source: Axys Analytical Services, Ltd.

[a] Suffix "L" indicates labeled compound.

[b] QC acceptance criteria for IPR, OPR, and samples based on a 20-µL extract final volume.

[c] PCBs 156 and 157 are tested as the sum of two concentrations.

DeCB –decachlorobiphenyl
DiCB – dichlorobiphenyl
HpCB – heptachlorobiphenyl
HxCB – hexachlorobiphenyl
IPR – initial precision and recovery
NA – not applicable
NoCB – nonachlorobiphenyl
OcCB – octachlorobiphenyl
OPR – ongoing precision and recovery
PCB – polychlorinated biphenyl
PeCB – pentachlorobiphenyl
QC – quality control
RSD – relative standard deviation
TeCB – tetrachlorobiphenyl
TriCB – trichlorobiphenyl

Table 4-7. Quality Control Samples, Instrumental Analysis, and Analyte Quantification for PCB Congener Analysis

Quality Control Parameter	Specification
Analysis duplicate	Must agree to within ±20% of the mean (applicable to concentrations >10 times the DL).[a]
Procedural blank	Analyte concentrations in blank samples for PCB congeners 77, 81, 114, 123, 126, and 169 must be less than 2 pg/congener/sample; and concentrations of PCB congeners 156, 157, 167, and 189 must be less than 10 pg/congener/sample. Concentrations of all other individual PCB congeners or coelutions must be less than 50 pg/congener/sample in blank samples. The sum of all 209 congeners should be less than 300 pg/sample. Higher levels are acceptable when sample concentrations exceed 10 times the blank levels.
Sample specific detection limit	Typical sample-specific detection limits, determined from chromatographic noise, are in the range of 0.5 to 2.0 pg.
Initial calibration	For 6-point calibration, a relative standard deviation of the RRF's ≤ 20% for all compounds. Ion ratios for all congeners must be within ±15% of theoretical for CS 0.2. Minimum S:N ratio 10:1 for all calibration standards. For CS0.2, S:N ratio may be as low as 3:1 for di-PCBs and nona-PCBs.
Continuing calibration/ verification	Refer to the table above (Table 4-6).
Analyte/surrogate ratios	Response must be within the calibrated range of the instrument. Coders may use data from more than one chromatogram to get the response in the calibrated range.
Ion ratios	Ion ratios must fall within ±15% of the theoretical values for positive identification of all targets in the calibration standards and samples.
Sensitivity	Minimum S:N ratio 10:1 for all calibration standards. For CS 0.2, S:N ratio may be as low as 3:1 for di-PCBs and nona-PCBs.

Source: Axys Analytical Services, Ltd.

[a] Duplicate criterion is a guideline; final assessment depends upon sample characteristics, overall batch QC and on-going laboratory performance.

CS – calibration solution
DL – detection limit
PCB – polychlorinated biphenyl
QC – quality control
RRF – relative response factor
S:N – signal-to-noise ratio

4.3 DATA VALIDATION PROCEDURES

Independent third-party data review and validation of the analytical chemistry data will be conducted by EcoChem, Inc. Validation will include Stage 4 (full-level) verification and validation of the PCB congener data, and Stage 2B (summary-level) verification and validation of the lipid and moisture data.

5.0 DATA MANAGEMENT

This section presents the 2012 modified data management procedures to the 2011 Bass SAP (GSI Water Solutions 2011) (Appendix A).

5.1 FIELD DATA MANAGEMENT

No changes are proposed to the field data management procedures outlined in the 2011 Bass SAP (GSI Water Solutions 2011) (Appendix A). The 2012 field sampling forms contain the same information as the 2011 fields sampling forms and are included as Appendix B to this document.

5.2 SAMPLE IDENTIFICATION

A unique ID code will be assigned to each smallmouth bass sample as part of the data record. A modified sampling ID code was derived for the 2012 bass sampling as follows:

- **Project phase** – All LWG samples will be prefixed with LW. The following character will indicate the phase of sampling under which the sample was collected, so that for the 2012 sampling, smallmouth bass samples will start with "LW4-."

- **Species name** – The species name is a two-character code that defines the type of organism sampled. "SB" will be used for smallmouth bass.

- **River mile and riverbank location** – Sampling locations will consist of two characters, indicating the river mile (rounded to the nearest whole mile) of the location. Riverbank sampling locations will consist of one character, indicating the east or west side of the river. For example bass collected from the west bank at River Mile 2 would have "02W."

- **Individual specimen numeration** – At each sampling location, individual specimens will be numbered from 01 to 99, following the riverbank location character and a dash. All samples will be analyzed as whole-body samples and will be designated as such with "WB" at the end of the sample ID.

Thus, for example, the first smallmouth bass collected from a sampling location on the east bank of River Mile 2 would be labeled as follows: LW4-SB02E-01WB. These numbers will be retained in the database with the information for each individual specimen collected (e.g., weight and length).

5.3 ELECTRONIC DATA MANAGEMENT

No changes are proposed to the electronic data management procedures outlined in the 2011 Bass SAP (GSI Water Solutions 2011) (Appendix A), other than the fact that LWG will manage the electronic data deliverables. The final data will be compiled onto a

Microsoft Access® flat file following the data reduction rules outlined in the 2011 Bass SAP (GSI Water Solutions 2011).

6.0 REPORTING

No changes are proposed to the reporting procedures outlined in the 2011 Bass SAP (GSI Water Solutions 2011) (Appendix A), other than the fact that LWG will manage the electronic data deliverables. The updated 2012 bass tissue collection reporting schedule is presented in Section 2.0.

7.0 REFERENCES

Anchor QEA, Windward, Kennedy/Jenks, Integral. 2012. Portland Harbor RI/FS. Draft feasibility study. Anchor QEA, LLC, Portland, OR; Windward Environmental LLC, Seattle, WA; Kennedy/Jenks Consultants, Portland, OR; Integral Consulting, Inc., Mercer Island, WA, Portland, OR.

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FIGURES

APPENDIX A. SAMPLING AND ANALYSIS PLAN: PORTLAND HARBOR 2011 BASELINE SMALLMOUTH BASS TISSUE STUDY